

CPC**COOPERATIVE PATENT CLASSIFICATION****F27D**

DETAILS OR ACCESSORIES OF FURNACES, KILNS, OVENS, OR RETORTS, IN SO FAR AS THEY ARE OF KINDS OCCURRING IN MORE THAN ONE KIND OF FURNACE ([combustion apparatus F23](#))

NOTE

Attention is drawn to the references and Notes following the title of class F27 and the Note III following the Contents of Section H.

F27D 1/00

Casings; Linings; Walls; Roofs ([refractory materials C04B](#); [firebridges for combustion chambers F23M 3/00](#))

F27D 1/0003

. {Linings or walls}

NOTE

not used, see subgroups

F27D 1/0006

.. {Linings or walls formed from bricks or layers with a particular composition or specific characteristics}

F27D 1/0009

... {Comprising ceramic fibre elements}

F27D 1/0013

.... {the fibre elements being in the form of a folded blanket or a juxtaposition of folded blankets}

F27D 1/0016

..... {Interleaved multiple folded blankets}

F27D 1/002

.... {the fibre elements being composed of adjacent separate strips}

F27D 1/0023

.. {Linings or walls comprising expansion joints or means to restrain expansion due to thermic flows}

F27D 1/0026

... {the expansion joint being a resilient element, e.g. a metallic plate between two bricks}

F27D 1/003

.. {Linings or walls comprising porous bricks}

F27D 1/0033

.. {Linings or walls comprising heat shields, e.g. heat shieldsd (**shields protecting the charge F27D 5/00**)}

F27D 1/0036

.. {Linings or walls comprising means for supporting electric resistances in the furnace}

F27D 1/004

.. {Linings or walls comprising means for securing bricks}

F27D 1/0043

. {Floors, hearths}

F27D 1/02

. Crowns; Roofs

F27D 1/021

.. {Suspended roofs}

F27D 1/022

... {Parts thereof, e.g. noses, arches}

F27D 1/024

... {having an anchored layer of lining}

F27D 1/025

.. {Roofs supported around their periphery, e.g. arched roofs}

- F27D 1/027 ... {Skew backs}
- F27D 1/028 ... {Means to prevent deformation of the arch}

- F27D 1/04 . characterised by the form {e.g. shape} of the bricks or blocks used
- F27D 1/042 .. {Bricks shaped for use in regenerators}
- F27D 1/045 .. {Bricks for lining cylindrical bodies, e.g. skids, tubes}
- F27D 1/06 . Composite bricks or blocks {e.g. panels, modules}
- F27D 1/063 ... {Individual composite bricks or blocks}
- F27D 1/066 {Individual composite bricks or blocks made from hollow bricks filled up with another material}
- F27D 1/08 . Bricks or blocks with internal reinforcement or metal backing

- F27D 1/10 . Monolithic linings; Supports therefor {Note: supports are classified in [F27D 1/14](#)}

- F27D 1/12 . incorporating cooling arrangements (constructions of tube assemblies in general [F28](#))

- F27D 1/14 . Supports for linings ([F27D 1/10](#) takes precedence)
- F27D 1/141 .. {Anchors therefor}
- F27D 1/142 ... {Anchors made from ceramic material}
- F27D 1/144 .. {Supports for ceramic fibre materials}
- F27D 1/145 .. {Assembling elements}
- F27D 1/147 ... {for bricks}
- F27D 1/148 {Means to suspend bricks}

- F27D 1/16 . Making or repairing linings {increasing the durability of linings or breaking away linings}
- F27D 1/1621 .. {Making linings by using shaped elements, e.g. bricks}
- F27D 1/1626 .. {Making linings by compacting a refractory mass in the space defined by a backing mould or pattern and the furnace wall}
- F27D 1/1636 .. {Repairing linings by projecting or spraying refractory materials on the lining}
- F27D 1/1642 ... {using a gunning apparatus}
- F27D 1/1647 {the projected materials being partly melted, e.g. by exothermic reactions of metals (Al, Si) with oxygen}
- F27D 1/1652 {Flame gunning; Use of a fuel}
- F27D 1/1668 {Plasma gunning}
- F27D 1/1673 ... {applied centrifugally}
- F27D 1/1678 .. {Increasing the durability of linings; Means for protecting}
- F27D 1/1684 ... {by a special coating applied to the lining}
- F27D 1/1694 .. {Breaking away the lining or removing parts thereof}

- F27D 1/18 . Door frames; Doors, lids, removable covers
- F27D 1/1808 .. {Removable covers}
- F27D 1/1816 ... {Removable covers specially adapted for arc furnaces}
- F27D 1/1858 .. {Doors}
- F27D 1/1866 ... {Door-frames}

- F27D 3/00** **Charging; Discharging; Manipulation of charge** (moving charge through a furnace [F27B 9/14](#))
- F27D 3/0021 . {of ceramic ware}
 - F27D 3/0022 .. {Disposition of the charge}
 - F27D 3/0024 . {of metallic workpieces}
 - F27D 3/0025 . {Charging or loading melting furnaces with material in the solid state}
 - F27D 3/0026 .. {Introducing additives into the melt}
 - F27D 3/0027 .. {Charging vertically with corbs}
 - F27D 3/0028 ... {Corbs}
 - F27D 3/003 .. {Charging laterally, e.g. with a charging box}
 - F27D 3/0031 .. {Charging with tiltable dumpers}
 - F27D 3/0032 .. {using an air-lock}
 - F27D 3/0033 . {charging of particulate material}
 - F27D 3/0084 . {Charging; Manipulation of SC or SC wafers}
 - F27D 3/02 . Skids or tracks for heavy objects
 - F27D 3/022 .. {Skids}
 - F27D 3/024 ... {Details of skids, e.g. riders}
 - F27D 3/026 .. {transport or conveyer rolls for furnaces; roller rails (conveyer rolls in general [B65G](#))}
 - F27D 3/028 ... {Roller rails or succession of small sized rollers}
 - F27D 3/04 . Ram or pusher apparatus
 - F27D 3/06 . Charging or discharging machines on travelling carriages
 - F27D 3/08 . Screw feeders; Screw dischargers
 - F27D 3/10 . Charging directly from hoppers or shoots
 - F27D 3/12 . Travelling or movable supports or containers for the charge
 - F27D 3/123 .. {Furnace cars}
 - F27D 3/14 . Charging or discharging liquid or molten material
 - F27D 3/145 .. {Runners therefor}
 - F27D 3/15 . Tapping equipment; Equipment for removing {or retaining} slag
 - F27D 3/1509 .. {Tapping equipment}
 - F27D 3/1518 ... {Tapholes}
 - F27D 3/1527 ... {Taphole forming equipment, e.g. boring machines, piercing tools}
 - F27D 3/1536 ... { Devices for plugging tap holes, e.g. plugs stoppers}{ Note: the devices fixed

- permanently to the melt container are classified in [F27D 3/15A](#))
- F27D 3/1545 . . . {Equipment for removing or retaining slag}
 - F27D 3/1554 {for removing the slag from the surface of the melt}
 - F27D 3/1563 {by the use of scrapers}
 - F27D 3/1572 {by suction}
 - F27D 3/1581 {by the use of blowers}
 - F27D 3/159 . . . {for retaining slag during the pouring of the metal or retaining metal during the pouring of the slag}
- F27D 3/16 . . . Introducing a fluid jet or current into the charge {(porous elements for gas flushing of molten metals [B22D 1/005](#))}
 - F27D 3/18 . . . Charging particulate material using a fluid carrier
- F27D 5/00** **Supports, screens, or the like for the charge within the furnace** (travelling or movable supports [F27D 3/12](#))
- F27D 5/0006 . . . {Composite supporting structures}
 - F27D 5/0012 {Modules of the sagger or setter type; Supports built up from them}
 - F27D 5/0018 {Separating elements}
 - F27D 5/0025 {assembled to present a three-point support}
 - F27D 5/0031 . . . {Treatment baskets for ceramic articles (for metallic articles [C21D 9/0025](#))}
 - F27D 5/0037 . . . {Supports specially adapted for semi-conductors}
 - F27D 5/0043 . . . {Supports specially adapted for dental prosthesis}
 - F27D 5/005 {Supports specially adapted for holding elongated articles in an upright position, e.g. sparking plugs}
 - F27D 5/0056 . . . {Hangers}
 - F27D 5/0062 . . . {Shields for the charge (shields for the lining [F27D 1/0033](#))}
 - F27D 5/0068 . . . {Containers}
- F27D 7/00** **Forming, maintaining, or circulating atmospheres in heating chambers**
- F27D 7/02 Supplying steam, vapour, gases, or liquids
 - F27D 7/04 Circulating atmospheres by mechanical means
 - F27D 7/06 Forming or maintaining special atmospheres or vacuum within heating chambers ([F27D 7/02](#) takes precedence)
- F27D 9/00** **Cooling of furnaces or of charges therein** ([F27D 1/00](#), [F27D 3/00](#) take precedence)

- F27D 11/00 Arrangement of elements for electric heating in or on furnaces (electric heating per se [H05B](#))**
- F27D 11/02 . Ohmic resistance heating
 - F27D 11/04 . . with direct passage of current through the material being heated
 - F27D 11/06 . Induction heating, i.e. in which the material being heated, or its container or elements embodied therein, form the secondary of a transformer
 - F27D 11/08 . Heating by electric discharge, e.g. arc discharge
 - F27D 11/10 . . Disposition of electrodes ([automatic control of temperature G05D 23/00](#); [electric discharge apparatus H01T](#); [arrangements for feeding or guiding electrodes H05B 7/10](#); [automatic control of power by positioning of electrodes H05B 7/144](#))
 - F27D 11/12 . with electromagnetic fields acting directly on the material being heated
- F27D 13/00 Apparatus for preheating charges; Arrangements for preheating charges**
- F27D 13/002 . {Preheating scrap ([preheating of scrap for steel making C21C 5/565](#))}
 - F27D 13/005 . {Drying of green clay prior to baking}
- F27D 15/00 Handling or treating discharged material; Supports or receiving chambers therefor**
- F27D 15/02 . Cooling
 - F27D 15/0206 . . {with means to convey the charge}
 - F27D 15/0213 . . . {comprising a cooling grate}
 - F27D 15/022 {grate plates}
 - F27D 15/0266 . . . {on an endless belt}
 - F27D 15/0273 . . . {on a rotary hearth}
 - F27D 15/028 . . . {comprising a rotary drum}
 - F27D 15/0286 . . {in a vertical, e.g. annular, shaft ([shafts including rotating parts F27D 15/0273](#))}
- F27D 17/00 Arrangements for using waste heat (heat-exchangers per se [F28](#)); Arrangements for using, or disposing of, waste gases**
- F27D 17/001 . {Extraction of waste gases, collection of fumes and hoods used therefor ([in general B08B 15/00](#))}
 - F27D 17/002 . . {Details of the installations, e.g. fume conduits or seals}
 - F27D 17/003 . . {of waste gases emanating from an electric arc furnace}
 - F27D 17/004 . {Systems for reclaiming waste heat}
 - F27D 17/008 . {cleaning gases}

- F27D 19/00** **Arrangements of controlling devices**
- F27D 21/00** **Arrangements of monitoring devices; Arrangements of safety devices**
- F27D 21/0014 . {Devices for monitoring temperature}
- F27D 21/0021 . {Devices for monitoring linings for wear}
- F27D 21/0028 . {Devices for monitoring the level of the melt}
- F27D 21/0035 . {Devices for monitoring the weight of quantities added to the charge}
- F27D 21/02 . Observation or illuminating devices
- F27D 21/04 . Arrangements of indicators or alarms
- F27D 25/00** **Devices { or methods} for removing incrustations, { e.g. slag, metal deposits, dust}; { Devices or methods for preventing the adherence of slag}**
- F27D 25/001 . { comprising breaking tools, e.g. hammers, drills, scrapers (breaking away linings [F27D 1/1694](#); boring machines for forming tapholes [F27D 3/1527](#))}
- F27D 25/003 .. { used for punching tuyeres}
- F27D 25/005 .. { used for cleaning the channels of induction furnaces}
- F27D 25/006 . { using explosives}
- F27D 25/008 . { using fluids or gases, e.g. blowers, suction units}
- F27D 27/00** **Stirring devices for molten material ([F27D 3/14](#) takes precedence)**
- F27D 27/005 . { Pumps}
- F27D 27/007 .. { Pulsating pumps}
- F27D 99/00** **Subject matter not provided for in other groups of this subclass**
- F27D 99/0001 . { Heating elements or systems}
- F27D 99/0003 .. { with particulate fuel, e.g. aspects relating to the feeding}
- F27D 99/0005 .. { Injecting liquid fuel}
- F27D 99/0006 .. { Electric heating elements or system}
- F27D 99/0033 .. { using burners (manufacture of steel in an electric arc furnace equipped with burners [C21C 5/5217](#))}
- F27D 99/0035 ... { Heating indirectly through a radiant surface}
- F27D 99/007 . { Partitions}

- F27D 99/0073 . { Seals}
 - F27D 99/0075 .. { Gas curtain seals}
 - F27D 99/0076 .. { Furnace car seals, i.e. seals used in continuous furnaces or kilns for preventing gas or heat exchange between heating chamber and the area comprising driving means}
- F27D 2001/00 Casings; Linings; Walls; Roofs** (refractory materials [C04B](#); firebridges for combustion chambers [F23M 3/00](#))
- F27D 2001/0046 . Means to facilitate repair or replacement or prevent quick wearing ([repairing linings F27D 1/16](#))
 - F27D 2001/005 .. Removable part or structure with replaceable elements
 - F27D 2001/0053 .. Furnace constructed in modules ([tunnel furnaces with add-on modules F27B 9/029](#))
 - F27D 2001/0056 .. Aspects of construction intended to prevent wear
 - F27D 2001/0059 . Construction elements of a furnace
 - F27D 2001/0063 .. Means to strengthen a part
 - F27D 2001/0066 .. Movable or removable parts ([removable parts for replacement because of wearing F27D 2001/005](#))
 - F27D 2001/0069 .. Means to prevent heat conduction ([heat shields F27D 1/0033](#))
 - F27D 2001/0073 ... Surrounding protection around the furnace, e.g. covers, circulation of gas
 - F27D 2001/0076 .. comprising a corrugated sheet
 - F27D 2001/0079 . Means to assemble at least two parts of a furnace or of any device or accessory associated to its use ([assembling elements for linings parts F27D 1/145](#))
 - F27D 2001/0083 .. Means to assemble a moving part to a fixed one ([movements due to thermal expansion F27D 1/0003](#); [movements of the cover F27D 1/18](#); [movements of the container or of the support of the cahrgue F27D 2003/0085](#))
 - F27D 2001/0086 ... the moving part being in rotation
 - F27D 2001/0089 ... the moving part being in translation
 - F27D 2001/0093 ... the moving part being hinged to the fixed one
 - F27D 2001/0096 ... the moving part staying in the same plane
 - F27D 2001/04 . characterised by the form {e.g. shape} of the bricks or blocks used
 - F27D 2001/045 .. {Bricks for lining cylindrical bodies, e.g. skids, tubes}
 - F27D 2001/047 ... Lining of cylindrical vessels
 - F27D 2001/16 . Making or repairing linings {increasing the durability of linings or breaking away linings}
 - F27D 2001/1605 .. Repairing linings
 - F27D 2001/161 ... Hot repair
 - F27D 2001/1615 ... through a hole in the casing, e.g. injecting refractory from outside the vessel
 - F27D 2001/1626 .. {Making linings by compacting a refractory mass in the space defined by a backing mould or pattern and the furnace wall}

- F27D 2001/1631 . . . using an expandable core
- F27D 2001/1636 .. {Repairing linings by projecting or spraying refractory materials on the lining}
- F27D 2001/1642 . . . {using a gunning apparatus}
- F27D 2001/1647 {the projected materials being partly melted, e.g. by exothermic reactions of metals (Al, Si) with oxygen}
- F27D 2001/1652 {Flame guniting; Use of a fuel}
- F27D 2001/1657 Solid fuel
- F27D 2001/1663 Fluid fuel, e.g. gas
- F27D 2001/1678 .. {Increasing the durability of linings; Means for protecting}
- F27D 2001/1684 . . . {by a special coating applied to the lining}
- F27D 2001/1689 obtained from materials added to the melt

- F27D 2001/18 . . Door frames; Doors, lids, removable covers
- F27D 2001/1808 .. {Removable covers}
- F27D 2001/1825 . . . Means for moving the cover
- F27D 2001/1833 comprising a screw mechanism
- F27D 2001/1841 comprising means for rotating or moving the cover in a horizontal or quasi horizontal plane
- F27D 2001/185 comprising means for tilting the cover
- F27D 2001/1858 .. {Doors}
- F27D 2001/1875 . . . Hanging doors and walls (movable partitions **R27D 23/00B2**)
- F27D 2001/1883 Hanging curtains
- F27D 2001/1891 . . . Doors for separating two chambers in the furnace

- F27D 2003/00** **Charging; Discharging; Manipulation of charge** (moving charge through a furnace [F27B 9/14](#))

- F27D 2003/0001 . . Positioning the charge
- F27D 2003/0002 .. involving positioning devices, e.g. buffers, buffer zones (involving sensors [F27D 2019/0071](#); involving sequence controllers [F27D 2019/0059](#); involving spacers [F27M 2002/016](#))
- F27D 2003/0003 .. involving a system for aligning the articles through a lateral guidance, e.g. funnel
- F27D 2003/0004 .. involving devices for measuring the article, the stack of articles or the height of the furnace passage or for adjusting the height of the passage to the charge or for putting the articles in the same position
- F27D 2003/0006 .. Particulate materials
- F27D 2003/0007 . . . Circular distribution
- F27D 2003/0008 . . . Longitudinal distribution
- F27D 2003/0009 . . . Separation of different types of fines, e.g. by a blower
- F27D 2003/001 . . . Series of dispensers or separation in two or more parts
- F27D 2003/0012 .. Working with piles
- F27D 2003/0013 . . . Unstacking or making stacks
- F27D 2003/0014 .. involving the use of magazines
- F27D 2003/0015 . . . the magazine being vertical

- F27D 2003/0016 . . . the magazine being a rotary device
- F27D 2003/0018 .. comprising means to introduce or extract the charge in series of separate containers or zones
- F27D 2003/0019 . . . simultaneously
- F27D 2003/002 .. Transforming a single row in a multiple row

- F27D 2003/0034 . Means for moving, conveying, transporting the charge in the furnace or in the charging facilities
- F27D 2003/0036 .. comprising inflatable or extendable parts
- F27D 2003/0037 .. comprising friction surfaces
- F27D 2003/0038 .. comprising shakers
- F27D 2003/0039 .. comprising magnetic means
- F27D 2003/004 . . . Magnetic lifters
- F27D 2003/0042 .. comprising roller trains
- F27D 2003/0043 . . . at least one of them being driven separately
- F27D 2003/0044 . . . at least one of them being removable
- F27D 2003/0045 . . . Use of rollable bodies, e.g. balls
- F27D 2003/0046 .. comprising one or more movable arms, e.g. forks
- F27D 2003/0048 . . . Walking beams
- F27D 2003/0049 comprising eccentrics or lever arms
- F27D 2003/005 comprising ramps
- F27D 2003/0051 .. comprising means to pick up the charge and put it down
- F27D 2003/0053 .. comprising a device for charging with the doors closed
- F27D 2003/0054 .. Means to move molten metal, e.g. electromagnetic pump
- F27D 2003/0055 . . . with flow regulation
- F27D 2003/0056 . . . through a syphon in a vacuum chamber, e.g. involving aspiration or pression on the bath

- F27D 2003/0057 .. Fast-outlet or inlet means
- F27D 2003/0059 .. comprising tracks, e.g. rails and wagon
- F27D 2003/006 . . . with a return track
- F27D 2003/0061 . . . with means for changing track
- F27D 2003/0062 .. using devices for tilting or rocking the charge
- F27D 2003/0063 .. comprising endless belts
- F27D 2003/0065 .. Lifts, e.g. containing the bucket elevators
- F27D 2003/0066 .. comprising scrapers or systems to pull out
- F27D 2003/0067 .. comprising conveyers where the translation is communicated by friction from at least one rotating element, e.g. two opposed rotations combined

- F27D 2003/0068 .. comprising clamps or tongs
- F27D 2003/0069 .. the device being suspended, e.g. from a crane
- F27D 2003/0071 .. Use of a comminuting device, e.g. grinding mill
- F27D 2003/0072 .. Use of a pinion and a rack
- F27D 2003/0073 .. the charge floating on a liquid, e.g. water
- F27D 2003/0074 . . . floating on water

- F27D 2003/0075 .. Charging or discharging vertically, e.g. through a bottom opening
- F27D 2003/0077 .. Use of centrifugal devices
- F27D 2003/0078 .. comprising jacks, e.g. hydraulic jacks
- F27D 2003/0079 .. Use of cams
- F27D 2003/008 .. comprising cross-beams or gantry cranes
- F27D 2003/0081 .. Series of little rams
- F27D 2003/0083 .. Means for stirring the charge

- F27D 2003/0085 . Movement of the container or support of the charge in the furnace or in the charging facilities
 - F27D 2003/0086 .. Up or down
 - F27D 2003/0087 .. Rotation about a vertical axis
 - F27D 2003/0089 .. Rotation about a horizontal or slightly inclined axis
 - F27D 2003/009 .. Oscillations about a horizontal axis; Rocking
 - F27D 2003/0091 .. Horizontally
 - F27D 2003/0092 ... with a reciprocating movement
 - F27D 2003/0093 .. Movement on a slope
 - F27D 2003/0095 .. the advancement being step by step
 - F27D 2003/0096 .. Advancement along the longitudinal axis of the workpiece
 - F27D 2003/0097 .. Advancement along an axis perpendicular to the axis of the workpiece
 - F27D 2003/0098 ... Workpiece rolling on its support

- F27D 2003/04 . Ram or pusher apparatus
 - F27D 2003/045 .. used to pull the charge

- F27D 2003/10 . Charging directly from hoppers or shoots
 - F27D 2003/105 .. using shutters

- F27D 2003/12 . Travelling or movable supports or containers for the charge
 - F27D 2003/121 .. Band, belt or mesh
 - F27D 2003/122 ... Band made from longitudinal wires or bars
 - F27D 2003/124 .. Sleds; Transport supports
 - F27D 2003/125 .. Charging cars, lift trolleys
 - F27D 2003/126 ... with long arms, charging forks
 - F27D 2003/127 ... for carrying pots (slag pots **R27D 23/00K6**)
 - F27D 2003/128 ... for carrying stacks of articles, e.g. bricks

- F27D 2003/16 . Introducing a fluid jet or current into the charge **{{porous elements for gas flushing of molten metals B22D 1/005}}**
 - F27D 2003/161 .. through a porous element
 - F27D 2003/162 .. the fluid being an oxidant or a fuel
 - F27D 2003/163 ... the fluid being an oxidant
 - F27D 2003/164 Oxygen
 - F27D 2003/165 ... the fluid being a fuel

- F27D 2003/166 . . the fluid being a treatment gas
- F27D 2003/167 . . the fluid being a neutral gas
- F27D 2003/168 . . through a lance
- F27D 2003/169 . . . Construction of the lance, e.g. lances for injecting particles

- F27D 2003/18 . . Charging particulate material using a fluid carrier
- F27D 2003/185 . . Conveying particles in a conduct using a fluid

- F27D 2005/00** **Supports, screens, or the like for the charge within the furnace** ([travelling or movable supports F27D 3/12](#))

- F27D 2005/0068 . [{Containers}](#)
- F27D 2005/0075 . . Pots, e.g. slag pots, ladles

- F27D 2005/0081 . Details
- F27D 2005/0087 . . Means to prevent the adherence of the charge
- F27D 2005/0093 . . Means to maintain the form of the article

- F27D 2007/00** **Forming, maintaining, or circulating atmospheres in heating chambers**

- F27D 2007/02 . Supplying steam, vapour, gases, or liquids
- F27D 2007/023 . . Conduits
- F27D 2007/026 . . Dampers ([registers for granular flows R27D 23/00B2](#))

- F27D 2007/04 . Circulating atmospheres by mechanical means
- F27D 2007/045 . . Fans

- F27D 2007/06 . Forming or maintaining special atmospheres or vacuum within heating chambers ([F27D 7/02 takes precedence](#))
- F27D 2007/063 . . Special atmospheres, e.g. high pressure atmospheres
- F27D 2007/066 . . Vacuum

- F27D 2009/00** **Cooling of furnaces or of charges therein** ([F27D 1/00](#), [F27D 3/00](#) take precedence)

- F27D 2009/0002 . Cooling of furnaces
- F27D 2009/0005 . . the cooling medium being a gas
- F27D 2009/0008 . . . Ways to inject gases against surfaces
- F27D 2009/001 . . the cooling medium being a fluid other than a gas
- F27D 2009/0013 . . . the fluid being water
- F27D 2009/0016 Water-spray
- F27D 2009/0018 . . the cooling medium passing through a pattern of tubes
- F27D 2009/0021 . . . with the parallel tube parts close to each other, e.g. a serpentine
- F27D 2009/0024 with contiguous tubes, which may be separately welded one to the other
- F27D 2009/0027 linked by elements

- F27D 2009/0029 fixed, e.g. welded to a supporting surface
- F27D 2009/0032 integrated with refractories in a panel
- F27D 2009/0035 arranged for the covering of a cylindrical surface
- F27D 2009/0037 the cooling medium passing a radiator
- F27D 2009/004 the cooling medium passing a waterbox
- F27D 2009/0043 Insert type waterbox, e.g. cylindrical or flat type
- F27D 2009/0045 the cooling medium passing a block, e.g. metallic
- F27D 2009/0048 incorporating conduits for the medium
- F27D 2009/0051 comprising use of studs to transfer heat or retain the liner
- F27D 2009/0054 adapted to retain formed bricks
- F27D 2009/0056 Use of high thermoconductive elements
- F27D 2009/0059 made mostly from graphite
- F27D 2009/0062 made from copper or copper alloy
- F27D 2009/0064 Cooling of furnace arches
- F27D 2009/0067 Cooling element inlet and outlet tubes

- F27D 2009/007 Cooling of charges therein
- F27D 2009/0072 the cooling medium being a gas
- F27D 2009/0075 in direct contact with the charge
- F27D 2009/0078 in indirect contact with the charge
- F27D 2009/0081 the cooling medium being a fluid (other than a gas in direct or indirect contact with the charge)
- F27D 2009/0083 the fluid being water
- F27D 2009/0086 applied in spray form
- F27D 2009/0089 Quenching
- F27D 2009/0091 in a fluidised bed of cooling elements
- F27D 2009/0094 making use of already cooled material, e.g. forming a layer
- F27D 2009/0097 the charge being used as a coolant

F27D 2013/00 Apparatus for preheating charges; Arrangements for preheating charges

- F27D 2013/007 using a rotary furnace

F27D 2015/00 Handling or treating discharged material; Supports or receiving chambers therefor

- F27D 2015/02 Cooling
- F27D 2015/0206 {with means to convey the charge}
- F27D 2015/0213 {comprising a cooling grate}
- F27D 2015/022 {grate plates}
- F27D 2015/0226 Support, fixation of the grate
- F27D 2015/0233 with gas, e.g. air, supply to the grate
- F27D 2015/024 Multiple grates
- F27D 2015/0246 Combination of fixed and movable grates

- F27D 2015/0253 Gradin grates
 - F27D 2015/026 Means to discharge the fines
 - F27D 2015/0286 . . {in a vertical, e.g. annular, shaft (shafts including rotating parts [F27D 15/0273](#))}
 - F27D 2015/0293 . . . including rotating parts
- F27D 2017/00 Arrangements for using waste heat (heat-exchangers per se [F28](#)); Arrangements for using, or disposing of, waste gases**
- F27D 2017/004 . {Systems for reclaiming waste heat}
 - F27D 2017/005 . . including pyrolising the waste gases
 - F27D 2017/006 . . using a boiler
 - F27D 2017/007 . . including regenerators
 - F27D 2017/009 . Cyclone for separating fines from gas
- F27D 2019/00 Arrangements of controlling devices**
- F27D 2019/0003 . Monitoring the temperature or a characteristic of the charge and using it as a controlling value
 - F27D 2019/0006 . Monitoring the characteristics (composition, quantities, temperature, pression) of at least one of the gases of the kiln atmosphere and using it as a controlling value
 - F27D 2019/0009 . . Monitoring the pression in an enclosure or kiln zone
 - F27D 2019/0012 . . Monitoring the composition of the atmosphere or of one of their components
 - F27D 2019/0015 . . . Monitoring the composition of the exhaust gases or of one of its components
 - F27D 2019/0018 . . Monitoring the temperature of the atmosphere of the kiln
 - F27D 2019/0021 . . . Monitoring the temperature of the exhaust gases
 - F27D 2019/0025 . . Monitoring the temperature of a part or of an element of the furnace structure
 - F27D 2019/0028 . Regulation
 - F27D 2019/0031 . . through control of the flow of the exhaust gases
 - F27D 2019/0034 . . through control of a heating quantity such as fuel, oxidant or intensity of current
 - F27D 2019/0037 . . . Quantity of electric current
 - F27D 2019/004 . . . Fuel quantity
 - F27D 2019/0043 Amount of air or O₂ to the burner
 - F27D 2019/0046 Amount of secondary air to the burner
 - F27D 2019/005 . . . Amount of heat given to the charge via a controlled heat exchanger
 - F27D 2019/0053 involving heating the charge in a fluid or fluidised medium
 - F27D 2019/0056 . . Regulation involving cooling
 - F27D 2019/0059 . . Regulation involving the control of the conveyer movement, e.g. speed or sequences
 - F27D 2019/0062 . . . control of the workpiece stay in different zones
 - F27D 2019/0065 . . Regulation involving controlled section modification
 - F27D 2019/0068 . . Regulation involving a measured inflow of a particular gas in the enclosure

- F27D 2019/0071 . . Regulation using position sensors
- F27D 2019/0075 . . Regulation of the charge quantity
- F27D 2019/0078 . . Regulation of the speed of the gas through the charge

- F27D 2019/0081 . Controlling an air-lock chamber

- F27D 2019/0084 . Controlling closure systems, e.g. doors

- F27D 2019/0087 . Automatisations of the whole plant or activity
- F27D 2019/009 . . Use of codes, e.g. bar codes

- F27D 2019/0093 . Maintaining a temperature gradient

- F27D 2019/0096 . involving simulation means, e.g. of the treating or charging step

- F27D 2021/00 Arrangements of monitoring devices; Arrangements of safety devices**

- F27D 2021/0007 . Monitoring the pressure

- F27D 2021/0035 . {Devices for monitoring the weight of quantities added to the charge}
- F27D 2021/0042 . . Monitoring the level of the solid charge

- F27D 2021/005 . Devices for monitoring thermal expansion

- F27D 2021/0057 . Security or safety devices, e.g. for protection against heat, noise, pollution or too much duress; Ergonomic aspects
- F27D 2021/0064 . . against noises
- F27D 2021/0071 . . against explosions
- F27D 2021/0078 . . against the presence of an undesirable element in the atmosphere of the furnace
- F27D 2021/0085 . . against molten metal, e.g. leakage or splashes
- F27D 2021/0092 . . against a jam in the transport line or a production interruption

- F27D 2021/02 . Observation or illuminating devices
- F27D 2021/023 . . Closable inserting openings, e.g. for the introduction of lances, sensors or burners
- F27D 2021/026 . . using a video installation

- F27D 2027/00 Stirring devices for molten material ([F27D 3/14](#) takes precedence)**

- F27D 2027/002 . Gas stirring

- F27D 2099/00 Subject matter not provided for in other groups of this subclass**

- F27D 2099/0001 . { Heating elements or systems}
- F27D 2099/0006 . . { Electric heating elements or system}
- F27D 2099/0008 . . . Resistor heating
- F27D 2099/001 the container being the resistor

- F27D 2099/0011 The resistor heats a radiant tube or surface
- F27D 2099/0013 immersed in the charge
- F27D 2099/0015 . . . Induction heating
- F27D 2099/0016 Different magnetic fields, e.g. two coils, different characteristics of the same coil along its length or different parts of the same coil used
- F27D 2099/0018 Relative movement of the coil and the charge during the heat treatment
- F27D 2099/002 Core heating
- F27D 2099/0021 . . . Arc heating
- F27D 2099/0023 DC arc heating
- F27D 2099/0025 . . . Currents through the charge
- F27D 2099/0026 . . . with a generator of electromagnetic radiations
- F27D 2099/0028 . . . Microwave heating
- F27D 2099/003 . . . Bombardment heating, e.g. with ions or electrons
- F27D 2099/0031 . . . Plasma-torch heating
- F27D 2099/0033 . . { using burners (manufacture of steel in an electric arc furnace equipped with burners [C21C 5/5217](#)) }
- F27D 2099/0036 . . . immersed in the charge
- F27D 2099/0038 . . . removable
- F27D 2099/004 . . . directed upon the charge, e.g. vertically
- F27D 2099/0041 with a small angle, e.g. almost tangentially
- F27D 2099/0043 . . . Impulse burner
- F27D 2099/0045 . . . Radiant burner
- F27D 2099/0046 . . . with incomplete combustion, e.g. reducing atmosphere
- F27D 2099/0048 Post- combustion
- F27D 2099/005 . . . Catalytic burner
- F27D 2099/0051 . . . Burning waste as a fuel
- F27D 2099/0053 . . . Burner fed with preheated gases
- F27D 2099/0055 Fuel
- F27D 2099/0056 Oxidant
- F27D 2099/0058 . . Means for heating the charge locally
- F27D 2099/006 . . Auxiliary heating, e.g. in special conditions or at special times
- F27D 2099/0061 . . Indirect heating
- F27D 2099/0063 . . . Liquid
- F27D 2099/0065 . . . Gas
- F27D 2099/0066 . . . Particles or solid bodies, e.g. bed of particles
- F27D 2099/0068 . . Heating directly by circulation of a fluid other than a gas or by particles
- F27D 2099/007 . { Partitions }
- F27D 2099/0071 . . Partitions used as registers
- F27D 2099/0073 . { Seals }
- F27D 2099/0078 . . Means to minimize the leakage of the furnace atmosphere during charging or discharging

- F27D 2099/008 . . . Using an air-lock ([use of air-locks for charging smelt furnaces F27D 3/0032](#))
- F27D 2099/0081 . . . Joint

- F27D 2099/0083 . . . Drives; Auxilliary drives

- F27D 2099/0085 . . . Accessories
- F27D 2099/0086 . . . Filters, e.g. for molten metals
- F27D 2099/0088 . . . Apparatus to cut metal, e.g. logs, in billets
- F27D 2099/009 . . . Bumpers
- F27D 2099/0091 . . . Means to grease or oil
- F27D 2099/0093 . . . Means to collect ashes or dust, e.g. vessels
- F27D 2099/0095 . . . Means to collect the slag or spilled metal, e.g. vessels ([cars to carry the pots F27D 2003/127](#))

- F27D 2099/0096 . . . Presses
- F27D 2099/0098 . . . Means for moving the furnace

F27D 2201/00 Manipulation of furnace parts

NOTE

Indexing code [F27D 2201/00](#) can be followed by additional indexing codes preceded by a + sign. These additional indexing codes are chosen from codes of subclass [R27D](#) describing similar manipulations of furnace charges.
 Example: [F27D 2201/00](#) + [F27D 2003/0036](#)